

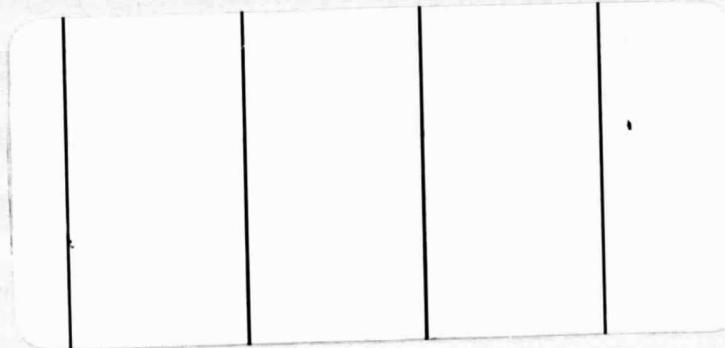
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**Retransmission of Hydrometric  
Data in Canada**  
SR 28190

**Applied Hydrology Division  
Department of the Environment  
Ottawa, Ontario, Canada  
K1A 0E7**

**July 1976**

**Quarterly Report for Period April-June 1976**

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12. Sponsoring Agency Name and Address Canada Centre for Remote Sensing Department of Energy, Mines & Resources 2464 Sheffield Road Ottawa, Ontario, K1A 0E4		13. Key Words (Selected by Principal Investigator) Landsat, Water Resources Data Alaska Receive Site
14. Supplementary Notes  Prepared by I.A. Reid and R.A. Halliday		
15. Abstract  Data Collection Platforms have been installed at 20 sites in remote areas of Canada for transmittal of water level and other water resource data. The implementation of the Alaska Receive Site in December, 1975 has increased the value of the system substantially. The near real-time data are used for water management purposes. The system has met all requirements and the suitability of satellite retransmission has been demonstrated.		

## I. Introduction

The Water Survey of Canada operates over 2,400 hydrometric stations at which water level data are collected. Because of the isolated locations of many of these stations, it usually is not economically feasible to telemeter data from the sites by conventional means. For this reason an experiment was conducted which involved transmitting data from nine sites by means of Landsat 1. The technical suitability of the system was demonstrated and in response to a demand for near real-time data from additional sites, it was decided to implement a larger network. In this way, it should be possible to determine the benefits and costs associated with a larger operational system.

## II. Techniques

Data Collection Platforms have now been installed at 20 sites including Principal Investigator A.C.D. Terroux, Platform 6210 at the Québec Department of Natural Resources gauging station on the Rivière Dumoine a la sortie du lac Dumoine, a tributary to the Ottawa River. An additional 7 DCPs will be installed in 1976. The sites (Figure 1, Table 1) were selected on the basis of real time data needs for water management purposes. Water level data are transmitted from all sites while additional parameters, mainly meteorological data, are transmitted from some sites.

Water levels are sensed at Water Survey of Canada gauging stations by a float and pulley or by servomanometer that sense the static pressure in a nitrogen purge system. Water level is usually recorded on a strip chart recorder. At those stations where DCPs are installed, an analogue to digital shaft position encoder (the Stevens Memomark II) is used to encode and store 16 bits (4 BCD digits) of water level data for transmittal by the DCP.

Precipitation data are obtained using a Fisher and Porter weighing type precipitation gauge. The gauge can be equipped with a Telekit for telemetering of data. The gauge is connected to a serial digital interface designed by Atmospheric Environment Service, (AES) Department of the Environment. The interface is known as a Hydrometeorological Automatic Recording and Telemetering System (HARTS). Air temperature in the HARTS system is sensed by a platinum resistance bulb thermometer. A precision thermistor (YSI 44033) is also used in some other cases.

The data transmitted by DCPs are processed by NASA, then sent to Canada in two ways. The first is by land line to the Canada Centre for Remote Sensing in Ottawa. The data usually arrives shortly after each orbit of the spacecraft. At CCRS the data are recorded simultaneously on a teletype hard copier and on magnetic tape. A software data retrieval system sorts the user

FIGURE 1

DATA COLLECTION PLATFORMS  
AT WATER SURVEY OF CANADA STATIONS

● INSTALLED  
○ PROPOSED INSTALLATION - 1976  
■ RNO (QUEBEC DEPT. OF  
NATURAL RESOURCES)

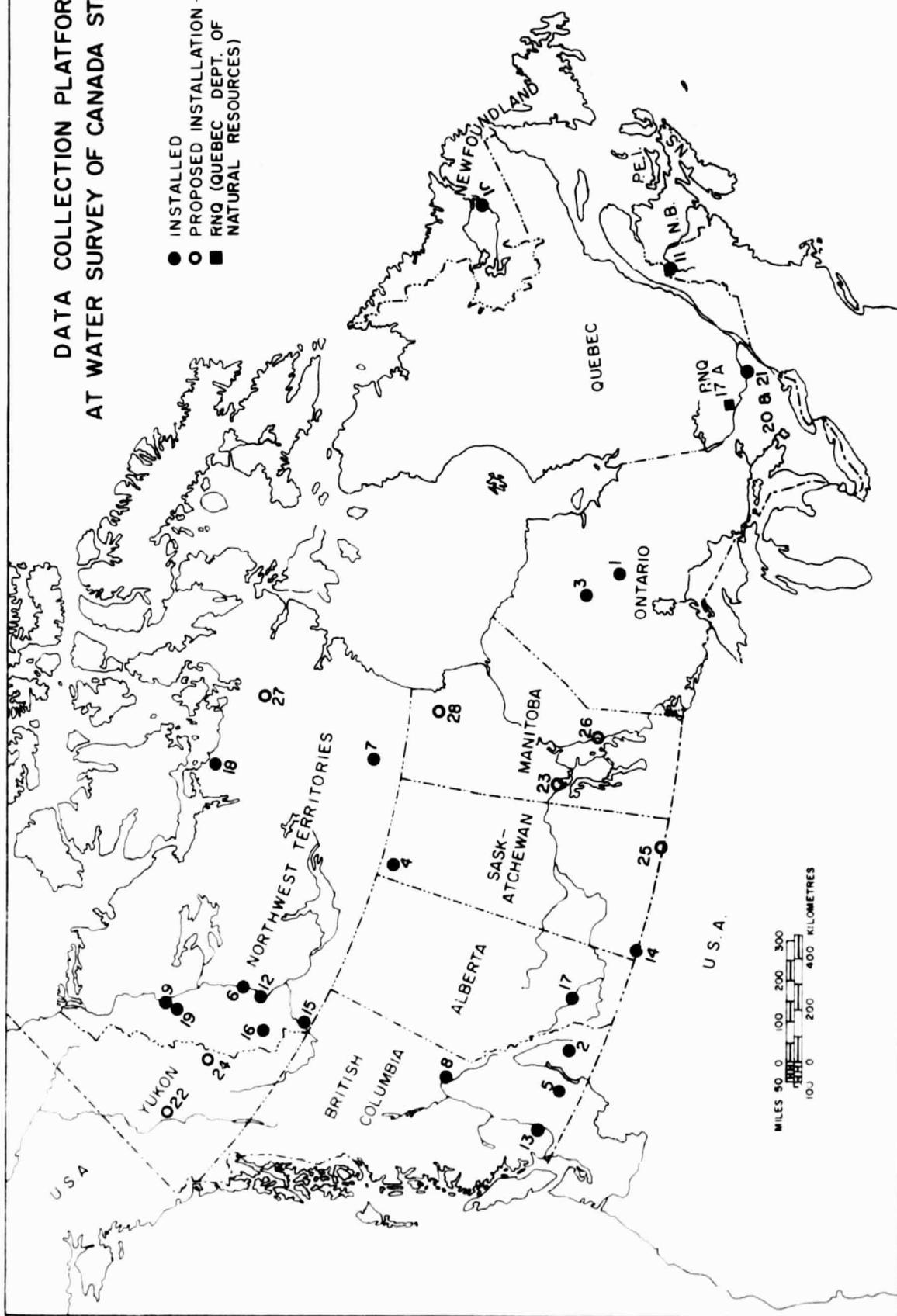


TABLE 1

## LOCATION OF DATA COLLECTION PLATFORMS

INSTALLED AT HYDROMETRIC STATIONS	DATE INSTALLED	DCP	LAT.	LONG.
1) Albany River above Nottik Island	Jan 13, 73	6102	51° 38'	86° 24'
2) Carney Creek below Pambrun Creek	Mar 25, 75	6126	50° 10'	116° 35'
3) Winisk River at Kanuchuan Rapids	Sept 27, 74	6137	52° 58'	87° 42'
4) Lake Athabasca at Crackington Point	Sept 19, 72	6150	59° 23'	108° 53'
5) Snow course No. 5A Mission Creek	Oct 31, 75	6232	49° 57'	118° 55'
6) Mackenzie River near Wrigley	June 7, 73	6260	63° 16'	123° 36'
7) Kazan River at Outlet of Ennadai Lake	Sept 19, 72	6353	61° 16'	100° 58'
8) McGregor River at Lower Canyon	Mar 9, 76	6501	54° 14'	121° 40'
9) Mackenzie River at Sams Sault Rapids	May 31, 73	6366	65° 46'	128° 45'
10) Churchill River at Muskrat Falls	Aug 7, 75	6502	53° 15'	60° 47'
11) St. Francis River at Outlet of Glasier Lake	Aug 13, 75	6504	47° 12'	68° 57'
12) Root River near the Mouth	July 15, 75	6512	62° 29'	123° 26'
13) Nahatlatch River below Tachewana Creek	Oct 20, 75	6514	49° 57'	121° 52'
14) Battle Creek at International Boundary	Oct 22, 75	6541	49° 00'	109° 25'
15) Liard River at Fort Liard	July 17, 75	6547	60° 15'	123° 29'
16) South Nahanni River above Virginia Falls	July 15, 75	6572	61° 38'	125° 48'
17) Bow River below Carseland Dams	Oct 27, 75	6574	50° 50'	113° 25'
17A Rivière Dumoine à la sortie du lac Dumoine (RNQ)	Mar 25, 76	6210	46° 49'	77° 52'
18) Ellice River near the Mouth	Apr 22, 76	6507	67° 42'	104° 08'
19) Mountain River below Cambrian Creek	May 7, 76	6542	65° 14'	128° 34'
20) Rideau River at Ottawa Test Site (now in operation in the GOES mode)	May 17, 76	6517	45° 23'	75° 42'
21) Rideau River at Ottawa Test Site (now in operation in the GOES mode)	May 21, 76	6521	45° 23'	75° 42'
PROPOSED - 1976				
22) Pelly River at Pelly Crossing		6354	62° 50'	136° 35'
23) Moose River near Moose Lake		6511	53° 38'	100° 19'
24) South MacMillan River at Mile 249 Canal Road		6522	62° 55'	130° 32'
25) Long Creek at Western Crossing of International Boundary		6524	49° 00'	103° 21'
26) Lake Winnipeg at Berens River		6527	52° 21'	97° 00'
27) Back River below Deep Rose Lake		6544	66° 05'	96° 30'
28) Seal River below Great Island		6571	58° 54'	96° 17'

platforms, reformats the data into engineering units and stores individual user files on disk. The user may then access his data file, usually daily, using either a teletype or telex remote terminal.

The second way that data are received from NASA is by punched card and uncalibrated computer listings about two weeks after transmittal by the DCP. These data are delivered to the Canadian Embassy in Washington, D.C., then carried by diplomatic bag to the Department of External Affairs in Ottawa. External Affairs then mails the data to the user. The cards are run in computer programs that sort the data and perform the conversion to engineering units. Data produced in this way are used to generate statistics on DCP performance, for quality checks and for archival purposes.

### III. Accomplishments

Platform 6210 was installed at the Québec Department of Natural Resources gauging station on the Rivière Dumoine à la sortie du lac Dumoine on March 25, 1976. Water level and temperature using a YSI thermistor are being sensed. The readings were used in a Streamflow Synthesis and Reservoir Regulation (SSARR) of the Ottawa River. The model was used for water level forecasting and river management by several agencies during the high flow period which ended June 30, 1976. During the period about 7 discrete water level readings were received daily from at least 3 daily orbits. The relatively low number of readings could be due to the dense coniferous canopy at the site. One 12-inch diameter white pine was cut at the time of installation to open up the dense tree cover. The DCP will be removed in July, 1976.

Table 2 is a summary of the data retransmitted for Landsat 2 cycles 24 to 28 covering a period from April 4 to July 2, 1976. During this period slightly over 18,000 messages were processed. Table 3 summarizes the results of messages received at Fairbanks, Alaska, Goldstone, California and Greenbelt, Maryland. The implementation of the Alaska receive site increases the value of the Landsat experiments significantly, especially for sites in the northern and northwestern areas of Canada.

A proposal for installation of Landsat and GOES DCS receive capability at the Prince Albert Satellite Station has been given approval in principle. A contract for the work should be signed during the next reporting period.

### IV. Significant Results

The project continues to demonstrate the feasibility of transmitting hydrometric data to polar orbiting spacecraft and using these data on a quasi-operational basis.

TABLE 2  
SUMMARY OF RETRANSMITTED DATA - APRIL 4 to JULY 2, 1976

Daily Mean Transmissions per cycle for cycles 24 to 28 (Landsat-2)  
(Transmissions received simultaneously at two or more sites are  
counted only once.)

Platform	24	25	26	27	28	Daily Max	Daily Min	Total
6102	8	8	8	7	8	13	3	697
6126	5	5	4	4	5	8	1	399
6137	18	18	19	20	20	25	9	1,682
6150	28	28	29	30	28	34	14	2,571
6210	11	10	7	10	7	14	1	810
6232	13	13	11	12	11	17	6	1,095
6260	-	-	48	48	38	56	6	1,725
6353	32	32	32	30	31	37	16	2,829
6354	-	-	9	-	1	15	1	49
6366	-	-	-	29	29	36	15	869
6501	2	1	6	-	-	9	1	41
6502	11	11	11	11	11	14	4	976
6504	10	10	-	-	8	14	3	450
6507	-	13	11	11	14	20	6	881
6512	-	-	11	16	18	26	5	744
6514	8	8	8	8	8	13	2	701
6522	-	1	1	-	-	1	1	3
6541	4	4	4	3	3	6	1	318
6542	-	10	11	8	6	17	1	487
6547	-	-	1	1	2	2	1	31
6572	-	-	15	15	9	7	681	
								18,039

Note Platform 6260 is on a 90 sec. interval. The minimum daily number of transmissions do not necessarily reflect the true minimum as the DCP could be turned off for a part of the day the minimum value occurred.

TABLE 3

MESSAGES RECEIVED FROM LANDSAT-2 DURING CYCLE 28 (JUNE 14 to JULY 1, 1976)

- 6 -

PID	Messages						Orbits					
	Received at			Total		Discrete	Messages Received at			Total		Discrete
	A	G	N	A	G	N	A	G	N	A	G	N
6102	10	28	129	167	154	10	23	67	100	100	83	
6127	48	65	12	125	87	46	46	9	101	101	63	
6137	139	102	172	413	356	80	52	63	195	195	118	
6150	319	129	122	570	499	134	59	58	251	251	164	
6210	4	12	128	144	137	4	10	54	68	68	59	
6232	118	112	27	257	194	74	52	18	144	144	93	
6260	348	56	14	418	368	70	22	10	102	102	76	
6353	362	128	148	638	567	140	57	65	262	262	176	
6354	4	10	0	15	12	4	11	0	15	15	11	
6366	449	93	37	579	517	157	53	28	238	238	172	
6502	34	11	159	204	193	29	11	68	108	108	84	
6504	2	7	126	135	129	2	6	50	58	58	51	
6507	193	33	50	276	247	109	31	41	181	181	129	
6512	284	68	27	379	326	135	50	20	205	205	145	
6514	82	92	7	181	136	60	48	7	115	115	71	
6541	17	44	8	69	54	17	29	7	53	53	34	
6542	94	14	2	110	97	65	13	2	80	80	68	
6547	12	11	0	23	14	12	11	0	23	23	14	
6572	234	58	7	299	262	120	39	7	166	166	125	

\* - Partial Cycle

A - Fairbanks, Alaska

G - Goldstone, California

N - Greenbelt, Maryland

All elements of the system are functioning well.

#### V. Publications

Preliminary Results Using GOES Data Collection System by I.A. Reid, A.C.D. Terroux and R.A. Halliday; Prepared for Data Collection Systems Users Conference on 16 June, 1976, Washington, D.C.

Hydrometric Field Procedures - Water Survey of Canada by R.A. Halliday; Prepared for World Meteorological Organization, International Seminar on Organization and Operation of Hydrologic Services, July 15-16, 1976, Ottawa, Canada. (This paper contains only a few paragraphs describing satellite data collection systems.)

Mr. E.F. Chapman, one of the Co-Investigators gave an informal lecture to Surveys, Geography and Computer technology students from Mount Royal College and the Southern Alberta Institute of Technology at Calgary, Alberta.

Mr. K.F. Davies, Area Engineer, District of Mackenzie, Northwest Territories gave an informal talk to the Ad Hoc Task Force of the Mackenzie Basin Intergovernmental Liaison Committee at Calgary, Alberta.

Abstracts of the above two talks were not prepared.

#### VI. Problems

At the moment four Ball Brothers Research Platforms, 6501, 6522, 6527, and 6571 are not transmitting due to unknown malfunctions. Steps are being made to get the platforms functioning for installation later this summer. Three Platforms, 6511, 6524, and 6544 are expected to be installed in the immediate future.

#### VII. Data Quality and Delivery

No change from previous report dated April 1976.

#### VIII. Recommendations

None at this time.

#### IX. Conclusions

Same as in previous report dated April, 1976.